# EVALUATION OF COMMON BEAN GENOTYPES UNDER WATER STRESS

**Guimarães, C.M.*, Del Peloso, M.J., Stone, L.F., Oliveira, J.P. de and Silva, A.C. de**

Embrapa Arroz e Feijão, CP 179, CEP 75375-000, Santo Antônio de Goiás, GO.
Phone (62) 3533-2178, Fax (62) 3533-2100. *cleber@cnpaf.embrapa.br

## INTRODUCTION

Common beans in Brazil are grown in the Cerrado region where Latosols are dominant. Annual rainfall in this region is about 1200 to 1500 mm, distributed from October to April. However water deficiency is common from January to April (Steinmetz et al., 1988), which is a major factor responsible for low crop yield. Hence it is recommended that drought tolerant cultivars should be developed. The objective of the work was to study the adaptation of common bean genotypes to water stress, as support for breeding programs with the objective to develop cultivars for areas subject to water deficit.

## MATERIALS AND METHODS

The experiment were conducted at the SEAGRO Experimental Station, Porangatu-GO, latitude 13° 18' 31", longitude 49° 06' 47", altitude 391 m, climate Aw, tropical of savanna, megatermic, as Köppen classification. The rainy season occurs from October to April and dry season occurs from May to September. During the experiment conduction did not rain and the relative humidity and the maximum and minimum temperature are presented in the Figure 1.

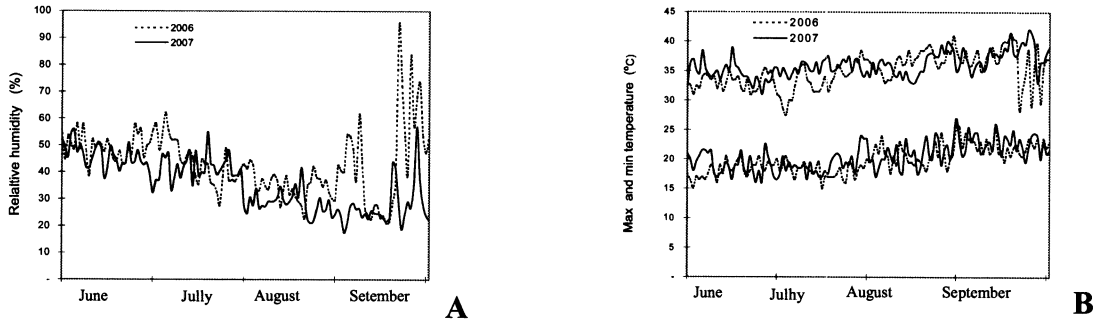


**Figure 1.** Relative humidity (A) and maximum and minimum temperature (B) during the development of the plants, in 2006 and 2007, at the SEAGRO Exp. Station-Porangatu-GO.

The planting was done on 11th June in 2006 and on 14th June in 2007. Genotypes were planted in four rows, each having four meter length with spacing of 40 cm. It was used the recommended agronomic practices. Forty-nine genotypes were evaluated in the randomized block design, with three replications, under drought and well irrigated conditions. The experiment was well irrigated, with the soil water potential higher than - 0.035 MPa at 15 cm depth (Silveira & Stone, 1994) from planting date to 20 days after emergence, when the water treatments were applied: 1) drought and 2) without drought stress. The irrigation on the second treatment was controlled with tensiometers. The first treatment received about ½ of the water applied at the second treatment. It was evaluated the yield and its components. It was applied the multivariable analysis using de method of Ward (1963) and the genotypes were classified based on the average grain yield of the two experimental years for each treatment.

## RESULTS AND DISCUSSION

The genotypes were classified in four groups using the Ward's method based on the grain yield averages of the two experimental years for each water treatment. It was observed that average yield of the groups significant differed in both treatments (Table 1). The average yields of the two experimental years were 863 kg $ha^{-1}$ and 2085 kg $ha^{-1}$, under drought and without drought stress, respectively. The drought stress decreased 58.6% of the yield.

**Table 1**. Summary of the multivariable analysis, considering the average yield observed under drought and without drought stress.

| F.V | D.F. | Yield (kg $ha^{-1}$) | |
|---|---|---|---|
| | | With drought stress | Without drought stress |
| Group | 3 | 258 207.75** | 875 554.98** |
| Error | 45 | 1 288.65 | 5031.61 |
| CV (%) | | 4.16 | 3.40 |

** Significant difference at 5% probability, by F test

It was observed that under drought the lower yielding group was formed by the genotypes G 3566, BRA 283983 CIAT G 6492, BAT 1203, BRASIL 0001, RAB 94 VERMELHO 2157, G 983, and BRA 129721 CIAT G 6896, that yielded 657 kg $ha^{-1}$. Under the same conditions the highest yielding genotypes were BAMBUÍ, FT 84 – 292, G 4280, BAT 304, and BRA 130583 CIAT G 6490, that yielded 1080 kg $ha^{-1}$, 64.4% higher than the first group. Under well irrigated conditions the lower yielding genotypes were BAT 1203, EMP 86, PIRATÃ 1, G 2475, BRASIL 0001, FE 732007 - XAMEGO, G 4489, FFT 85 - 75 - PORTO REAL, and G 2359, that yielded 1754 kg $ha^{-1}$. Under the same conditions the highest yielding genotypes were BRA 130583 CIAT G 6490, FT 84 - 292, G 4825, G 20716, IPA 7, G 2358, G 13571, BRA 283983 CIAT G 6492, FT 85 - 79, G 1356, and IAC UNA, that yielded 2429 kg $ha^{-1}$, 38.5% higher than the first group. The genotypes BRA 130583 CIAT G 6490 and FT 84 - 292 were classified as the most productive when well irrigated or when water stressed, while the genotypes BRA 283983 CIAT G 6492, BRA 129721 CIAT G 6896, and G 983 were classified as productive when well irrigated, but were more susceptible to drought. It was also verified that the number of pods per plant was the most sensitive yield component to water deficit in common bean and significantly affected the yield under drought ($r=-0.413$, $p\leq0.003$). It was responsible under drought for 22.7% of the yield variability and each one unit of this variable increased 46 kg $ha^{-1}$ of the bean yield.

## CONCLUSIONS

The genotypes BRA 130583 CIAT G 6490 and FT 84 - 292 were classified as the most productive when well irrigated. The BRA 283983 CIAT G 6492, BRA 129721 CIAT G 6896, and G 983 were classified as productive when well irrigated, but were more susceptible to drought. It was also verified that the number of pods per plant was the most sensitive yield component to drought in common bean.

## REFERENCES

Silveira, P.M. da; Stone, L.F. Manejo da irrigação do feijoeiro: uso do tensiômetro e avaliação do desempenho do pivô central. Brasília: EMBRAPA-SPI, 1994. 46p. (EMBRAPA-CNPAF. Documentos, 27).

Steinmetz, S.; Reyniers, F.N.; Forest, F. Caracterização do regime pluviométrico e do balanço hídrico do arroz de sequeiro em distintas regiões produtoras do Brasil: síntese e interpretação dos resultados. Goiânia: EMBRAPA-CNPAF, 1988. v.1. 66p. (EMBRAPA-CNPAF. Documentos, 23).

Ward, J.H. Hierarchical grouping to optimize an objective function. Journal of the American Statistical Association, Washington, v.58, n.301, p.236-244, 1963.